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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,508	08/22/2003	Junichi Aoyama	09792909-5680	9683

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EXAMINER

NGUYEN, DILINH P

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/646,508

Applicant(s)

AOYAMA ET AL.

Examiner

DiLinh Nguyen

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 5-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

Claims 5, 8 and 11 are objected to because of the following informalities:

Replace "0.degree. C." with -- 0°C --.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 8-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase: "...forming a gas impermeable film on the wirings and above gaps existing between the wirings, in a gas atmosphere having a thermal conductivity equal to or higher than three times that of air at 0°C..." renders the claim indefinite.

It is not clear how the gas impermeable film on the wirings and above gaps existing between the wirings, in a gas atmosphere having a thermal conductivity equal to or higher than three times that of air at 0°C?

The drawings and the specification disclose that forming a gas permeable film 14 on the wiring 12 and the filling layer 13; removing the filling layer through the gas permeable film so as to form gaps 15 between the wirings; filling gaps with a gas 16 having a thermal conductivity equal to or higher than three times that of air at 0°C (figs. 1C-2C, page 22, lines 8-15).

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 5, 7-8, 10-11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clevenger et al. (U.S. Pat. 6255712) [previously applied] in view of Nogami et al. (U.S. Pat. 6524429) [newly cited].

- Regarding claims 5 and 11, Clevenger et al. disclose a semiconductor device comprising:

forming a wiring and a filling layer 16 filling between wirings 11 on a substrate 0 (fig. 7);

forming a gas permeable film 15 on the wiring and the filling layer (fig. 9);

removing the filling layer through the gas permeable film so as to form a gap between the wirings;

filling a gas having a thermal conductivity equal to or higher than three times that of air at 0°C [the gas is one of helium gas] (fig. 9, column 3, lines 32-41 and column 5, lines 49-66); and

forming a gas impermeable film 19 (fig. 9) on the gas permeable film.

Clevenger et al. fail to disclose the filling layer comprises: a non-fluorine system polymer from the group consisting of BCB, poly-aryl-ether, polyimide, and like effective non-fluorine system polymers;

a fluorine system polymer selected from the group consisting of a fluorine addition polymer, tetra-fluoro ethylene, cyclo-perfluoro carbon, poly-aryl-fluoride ether, fluorine addition parylene, and like effective fluorine system polymers, organic SOG, silicon oxide system xerogel, nano-porous silica, or amorphous carbon.

Nogami et al. disclose an insulating layer includes fluorine free polymers such as BCB, and polyimide; fluorine containing polymers such as fluorine added polyimide, tetrafluoroethylenen, cycloperfluorocarbon, fluorinated polyaryl ether and fluorine added parylene; organic SOG, silicon oxide xerogel, and amorphous carbon (column 3, lines 62-67). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select the system polymer as known material, as taught by Nogami et al. into the device of Clevenger et al. for forming the filling layer since the system polymer can be reliably filled between the wirings and the wirings neither damaged nor broken (column 3, lines 1-4). Moreover, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co., Inc. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

- Regarding claim 8, in so far as it is understood, Clevenger et al. disclose a semiconductor device comprising:

forming a plurality of wirings 11 on a substrate 0 with a filling layer between the wirings (figs. 5-7);

forming a gas impermeable film 19 on the wirings and above gaps existing between the wirings (fig. 9, column 5, lines 52-55);

filling a gas having a thermal conductivity equal to or higher than three times that of air at 0°C [the gas is one of helium gas] (fig. 9, column 3, lines 32-41 and column 5, lines 49-66); and

forming a gas impermeable film 19 (fig. 9) on the gas permeable film.

Clevenger et al. fail to disclose the filling layer comprises: a non-fluorine system polymer from the group consisting of BCB, poly-aryl-ether, polyimide, and like effective non-fluorine system polymers;

a fluorine system polymer selected from the group consisting of a fluorine addition polymer, tetra-fluoro ethylene, cyclo-perfluoro carbon, poly-aryl-fluoride ether, fluorine addition parylene, and like effective fluorine system polymers, organic SOG, silicon oxide system xerogel, nano-porous silica, or amorphous carbon.

Nogami et al. disclose an insulating layer includes fluorine free polymers such as BCB, and polyimide; fluorine containing polymers such as fluorine added polyimide, tetrafluoroethylenen, cycloperfluorocarbon, fluorinated polyaryl ether and fluorine added parylene; organic SOG, silicon oxide xerogel, and amorphous carbon (column 3, lines 62-67). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select the system polymer as known material, as taught by Nogami et al. into the device of Clevenger et al. for forming the filling layer since the system polymer can be reliably filled between the wirings and the wirings neither damaged nor broken (column 3, lines 1-4). Moreover, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co., Inc. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

- Regarding claims 7, 10 and 13, Clevenger et al. disclose wherein the gas is one of helium gas (column 3, line 37).
3. Claims 6, 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clevenger et al. (U.S. Pat. 6255712) [previously applied] in view of Nogami et al. (U.S. Pat. 6524429) [newly cited] and further in view of Xia et al. (U.S. Pat. 6472333) [previously applied].

Clevenger et al. disclose the gas permeable film is made of a porous insulation material [hard mask is made of silicon oxide] (column 4, lines 58-60) but Clevenger et al. fail to disclose the gas impermeable film 19 is made of silicon nitride.

Xia et al. disclose a gas impermeable film is made of silicon oxide or silicon nitride (column 1, lines 49-55). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select either silicon oxide or silicon nitride for a gas impermeable film of the above combination because as taught by Xia et al., such material are equivalent for their use in the semiconductor art as a gas impermeable film. Moreover, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co., Inc. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DiLinh Nguyen whose telephone number is (571) 272-1712. The examiner can normally be reached on 8:00AM - 6:00PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DLN

A handwritten signature in black ink, appearing to read 'Hoai Pham', with a long horizontal flourish extending to the right.

HOAI PHAM